



Discrete Water Quality Monitoring: Water Year 2023

Background

The Obed Wild and Scenic River (OBRI) is a major free-flowing tributary in the upper Tennessee River system. The watershed comprises three major tributaries, Obed River (170 square miles [440.3 square kilometers]), Clear Creek (173 square miles [448.1 square kilometers]), and Daddys Creek (175 square miles [453.2 square kilometers]), in addition to smaller headwater streams. Obed Wild and Scenic River supports one of the most biologically diverse river systems of rare and threatened habitats, and wildlife resources, including 54 native fish species, 12 freshwater mussels, and numerous other aquatic species. Among these are five imperiled fish species and two freshwater mussel species.

The Obed River is the only Wild and Scenic River in Tennessee. The Wild and Scenic Rivers Act established a policy to preserve rivers in a free-flowing condition, protect their water quality, and promote their outstandingly remarkable values for the benefit and enjoyment of present and future generations (Public Law 90-542). In recognition of their exceptional ecological and recreational significance, streams within the Obed Wild and Scenic River boundary were designated by the State of Tennessee as Outstanding National Resource Waters (ONRW).



Monitoring at Obed Wild and Scenic River. NPS photo / APHN staff.

Highlights

- *E. coli* standards were exceeded once at Obed River at Adams Bridge.
- pH standards were not obtained twice at Rock Creek near the Rock Creek Campground.
- Elevated specific conductance was observed at Obed River at Adams Bridge.
- All sites met state standards for dissolved oxygen and water temperature.
- All sites had excellent water clarity.

Issues of Management Concern

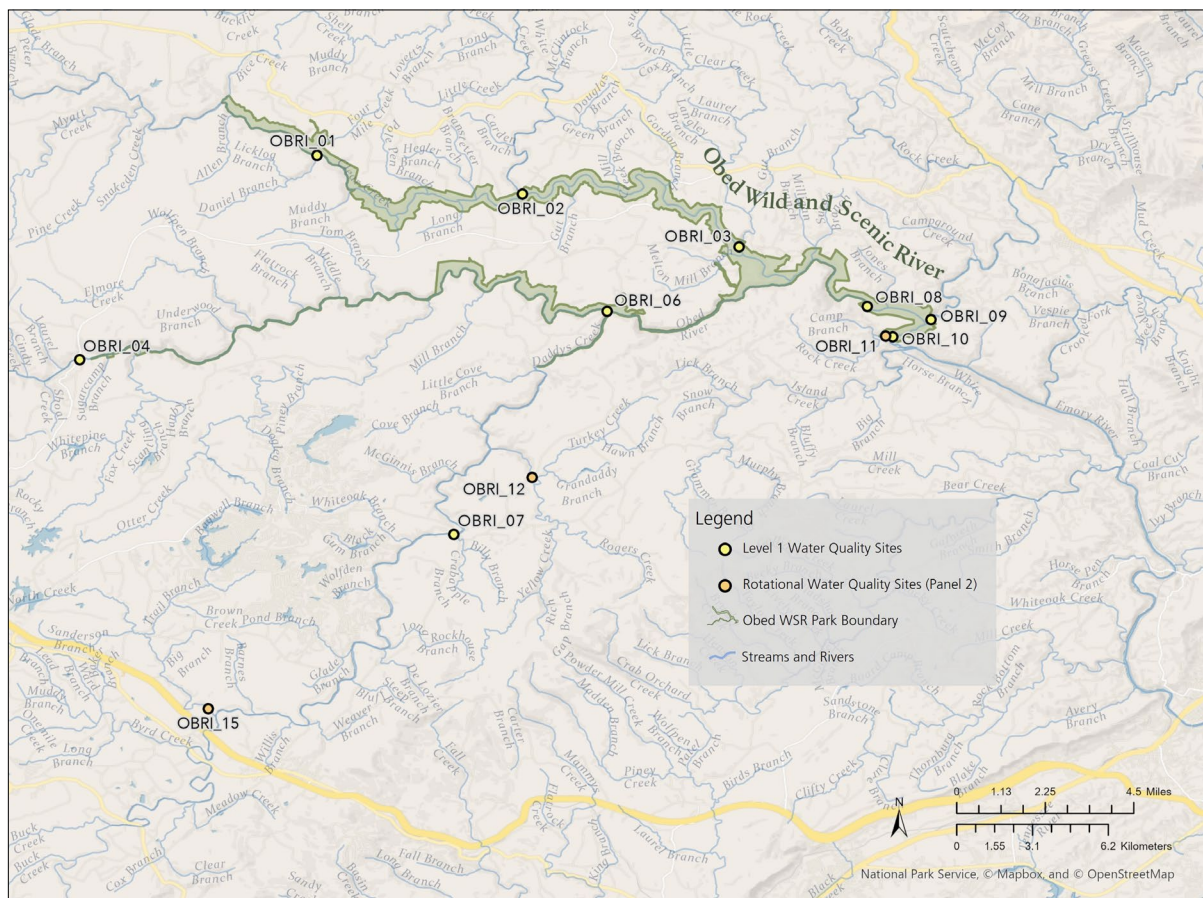
The main issues negatively influencing water resources at Obed Wild and Scenic River are sedimentation, erosion, nutrient inputs, and contamination from land development, mineral extraction, wastewater discharge, agricultural and commercial forestry operations, and drainage from abandoned mines. In addition, water demands and urban development have increasingly affected the ecological and biological integrity of the park.

Monitoring and Objectives

The Appalachian Highlands Inventory and Monitoring Network (APHN) monitors water quality at strategic integrator sites to identify water resource conditions. The network monitors core water quality parameters including:

- Streamflow
- Water Temperature
- Dissolved Oxygen
- pH
- Specific Conductance
- ANC (acid neutralizing capacity)
- *Escherichia coli* (*E. coli*)
- Turbidity
- Trace Metals
- Nutrients
- Major Ions

For detailed methods, see Hughes et al. 2018.



Map of discrete water quality monitoring sites in the Obed Wild and Scenic River (OBRI) watershed.

Table of identification numbers (Site ID) and location/stream names (Site Name) for water quality monitoring sites sampled in WY 2023.

Site ID	Site Name
OBRI_01	Clear Creek at Norris Ford
OBRI_02	White Creek at mouth near Barnett Bridge
OBRI_03	Clear Creek at Lilly Bridge
OBRI_04	Obed River at Adams Bridge
OBRI_06	Obed River at Obed Junction upstream of Daddys Creek
OBRI_07	Daddys Creek at Antioch Bridge
OBRI_08	Obed River at Alley Ford
OBRI_09	Emory River upstream of Obed Confluence
OBRI_10	Emory River at Nemo Bridge above Rock Creek
OBRI_11	Rock Creek at mouth near Nemo Bridge
OBRI_12	Yellow Creek at Hebbertsburg
OBRI_15	North Creek near Fairfield Glade



Measuring streamflow on the Emory River upstream of the Obed River confluence. NPS photo / APHN staff.

Significant Findings

Water sampling during water year 2023 (WY23) occurred from October 2022 to September 2023. Including four QA/QC samples, 43 samples were collected from 12 sites. We are on rotational panel 2 of the monitoring plan for WY23 and WY24 (see Hughes et al. 2018). As of WY23, we have revised our sampling periods from quarterly to triannually.

There were three violations of Tennessee State Water Quality Standards in WY23: one violation of *E. coli* and two violations of pH state standards. *Escherichia coli* (*E. coli*) concentrations exceeded the individual sample criteria of less than 487 CFU/100ml for Tennessee Outstanding Natural Resource Waters at Obed River at Adams Bridge (524.7 MPN/100ml). Overall, *E. coli* was low during WY23, with a mean of 67.1 MPN/100ml for all site measurements. Of note, the discrepancy in units, CFU (colony forming units) and MPN (most probable number), is a difference in test methods but are accepted as 1:1 equivalencies.

There were two violations of the Tennessee State Standard for pH, which states pH shall remain between 6.0 to 9.0 SU (standard units). Both violations occurred at Rock Creek near Nemo Bridge where mean pH was 5.88 SU. This site has known historic impacts from acid mine drainage. At the small tributary that runs under the bridge and into Rock Creek at the Rock Creek Campground, pH was as low as 4.36 SU in WY23.

Water temperature and dissolved oxygen met all water quality criteria, with temperature remaining below 30.5°C (86.9°F) and dissolved oxygen above 5 mg/L. Natural reference conditions for specific conductance, as there are no state standards, are below 100 µS/cm (microsiemens per centimeters) for medium to large rivers and below 50 µS/cm in smaller streams at Obed Wild and Scenic River. Specific conductance was below 100 µS/cm at most sites (mean = 75.6 µS/cm) and ranged from 24 µS/cm to 331 µS/cm. Obed at Adams Bridge had the highest conductance, with values nearing levels shown to cause biological impairments over time (EPA 2011).

Turbidity was low at all sites, ranging from 0.0 FNU to 5.39 FNU with a mean of 1.4 FNU (Formazin Nephelometric Units). This is below the nutrient criteria recommendations for the region (2.3 FNU, EPA 2021), indicating the streams and rivers of Obed Wild and Scenic River have excellent clarity.

Water quality data are available upon request to the Appalachian Highlands Network. Past water quality reports and briefs are available on the [Appalachian Highlands Network website](https://www.nps.gov/im/apnh/reports-publications.htm) (https://www.nps.gov/im/apnh/reports-publications.htm).

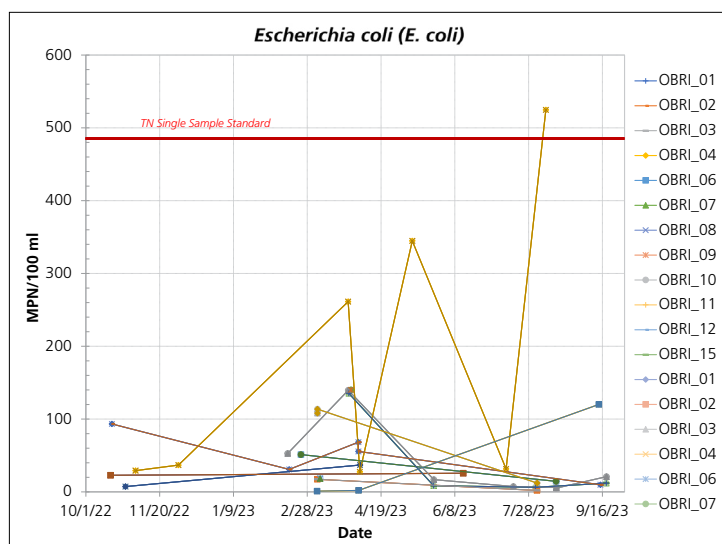


Figure 1. *E. coli* results at Obed Wild and Scenic River WQ sampling sites during water year 2023. Red line indicates the TN State Water Quality Standard of 487 CFU/100 ml.

Literature Cited

- Hughes, J., R. Emmott, E. Raskin, and B. Witcher. 2018. Long-term discrete water-quality monitoring at Big South Fork National River and Recreation Area, Blue Ridge Parkway, and Obed Wild and Scenic River: Protocol narrative. Natural Resource Report NPS/APHN/NRR—2018/1840. National Park Service, Fort Collins, Colorado. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2258269>
- U. S. Environmental Protection Agency. (EPA) 2011. A field-based aquatic-life benchmark for conductivity in Central Appalachian streams. Office of Research and Development National Center for Environmental Assessment, Washington, D.C. EPA/600/R10/023F.
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